EFFICIENCY EVALUATION IN INSURANCE SECTOR: A REVIEW

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Abstract

Insurance sector is mainly divided into two segments, that are, life insurance sector and non-life insurance sector. Insurance sector is a service sector providing safety to its customers. This sector also provides investment opportunities and thus, has a positive impact on the growth of the nation. Measurement of efficiency of insurance companies helps in increasing the quality of their services and activities. Unlike a production process, measurement of efficiency of a service sector is quite difficult. Data envelopment analysis (DEA) is a widely applied tool to measure the productivity and efficiency of the units. DEA is extensively used in the service industries such as educational institutions, hospitals, information technology industry, financial institutions. This paper is a review study of efficiency evaluation of life and non-life insurance companies based on DEA.

Keywords: life insurance companies, non-life insurance companies, efficiency, data envelopment analysis.

Introduction

Indian insurance sector in its present form has its history dating back to British rule, when insurance company was set up as a British company called the Oriental Life Insurance Company in 1818. It was followed by the setting up of Bombay Assurance Company in 1823 and the Madras Equitable Life Insurance Society in 1829. Despite being operated in India these companies did not insure the lives of Indians. They insured the lives of Europeans living in India. Some of the companies that started later provided insurance for Indians, as they were treated as 'substandard'. In 1870, the first Indian insurance company named 'Bombay Mutual Life Assurance Society' started working.

During the Swadeshi movement in the early 20th century, insurance witnessed a big boom in India with several more companies being set up. In the year 1912, the Life Insurance Companies Act and the Provident Fund Act were passed to regulate the insurance business. They were the first legislations in India that

particularly targeted the insurance sector. These acts were followed by a detailed and amended Insurance Act, 1938.

With the main aim of spreading life insurance to rural areas and to channelize huge funds accumulated by life insurance companies to nation building activities, the Government of India nationalized the life insurance industry in January 1956 by merging about 245 life insurance companies and forming Life Insurance Corporation of India (LIC), which started functioning from 1 September 1956. The general insurance industry was nationalized in 1972 by amalgamating nearly 107 insurers into four companies- National Insurance Company, New India Assurance Company, Oriental Insurance Company and United India Insurance Company. These were subsidiaries of the General Insurance Corporation of India (GIC). With effect from December 2000, these subsidiaries have been de-linked from GIC and were set up as independent insurance companies.

Until 1999, there were no private insurance companies in India. The government then introduced the Insurance Regulatory and Development Authority Act in 1999, thereby de-regulating the insurance sector, lifting all entry restrictions for private players and allowing foreign players to enter the market with some limits on direct foreign ownership.

The insurance sector went through a full circle of phases from being unregulated to completely regulated and then currently being partly deregulated. Insurance sector reforms was first suggested by Malhotra Committee in 1993, headed by the former Finance Secretary and RBI Governor R.N. Malhotra. This committee suggested the setting up of an independent regulatory body, in accordance to which the *Insurance Regulatory and Development Authority (IRDA)* was founded in 1999. IRDA was set up to provide greater autonomy to insurance companies so as to improve their performance and enable them to act as independent companies.

The privatization and liberalization in insurance sector ensure the efficient and effective services to the insured ones. To check whether the liberalization and privatization of insurance sector have achieved their objectives, it is important to measure the efficiency of the insurance sector in India. Efficiency measurement in the insurance companies increases the quality of their activities and assists them to identify and solve the problems. Data Envelopment Analysis (DEA) and Stochastic Frontier Approach (SFA) are the techniques that are widely applied to measure the relative efficiency of a set of production systems. DEA is a non-parametric mathematical programming approach to frontier estimation, which uses data to determine a sphere that represent the best practice for measuring efficiencies and inefficiencies. This study reviewed the efficiency evaluation of insurance companies around the world.

Review of literature

A number of research studies have been conducted in India and abroad on measurement of efficiency of insurance companies. The studies have been categories in four heads. Following is a brief account of these studies conducted to find out the efficiency of the insurance sector around the globe during different time periods.

Efficiency evaluation of insurance companies:

Fecher *et al.* (1993) assessed the relative production performance of French life and non-life insurance companies for the year 1984-1989 using DEA and SFA. They used various models and found that there was high correlation between the results obtained from both methodologies. There was a wide dispersion in the inefficiency rates across companies.

Delhausse *et al.* (1995) addressed the issues of productive efficiency and optimal scale of the non-life insurance industry in France and Belgium. They took a sample of 243 French and 191 Belgian companies and found that French companies were more efficient than Belgian companies.

Rai (1996) reported that specialised firms were more cost efficient than combined firms while examining the cost efficiency of insurance firms located in 11 countries including Japan and US. **Hao and Chou (2005)** also supported the above results in their study of life insurance firm in Taiwan by concluding that diversification of product strategy was unable to help a firm to improve its operational efficiency.

Rai (1996) and **Hussels and Ward (2007)** found that firms in UK were inefficient when they took up the study of cost efficiency of insurance firms located in 11 countries including Japan and US and addressed the impact of insurance market deregulation through a comparison of the UK and German markets respectively.

Fukuyama (1997) investigated productive efficiency and productivity changes in life insurance companies by focusing primarily on the ownership structures and economic conditions in Japan. Inputs were capital, office workers, sales representatives and outputs were insurance reserves, loans. He found that productive efficiency and productivity performances differ across ownership types under different economic conditions.

Donni and Fecher (1997) measured technical efficiency levels in 15 OECD insurance industries using DEA. They used labor as input and net premium as output. They found high and dispersed average efficiency levels, which were favoured by reinsurance rates and market shares. In addition, growth in the productivity observed in all countries was essentially imputable to improvements in technical progress.

Cummins *et al.* (1998) investigated the effects of mergers and acquisitions of life insurer on efficiency during 1988-1995 in US using DEA and found that mergers and acquisition had a beneficial effect on efficiency. Firms operating with non-decreasing returns to scale and financially vulnerable firms were the acquisition targets.

Rees *et al.* (1999) gave an account of the European Union's policy of deregulation in insurance markets and evaluated its effects using DEA in Germany and UK. They found increase in efficiency levels due to looser regulation and competition. They concluded that European Commission's policy had improved the welfare of insurance buyers.

Cummins (1999) evaluated the efficiency of U.S. life insurance companies taking a sample of 750 firms during 1988-1995. Administrative labor, agent labor, business services, financial capital were taken as inputs and incurred benefits, additions to reserves were taken as output variables for the study. He found that cost and technical efficiency had risen but revenue efficiency was highly dispersed and very low on average.

Mahlberg and Url (2000) assessed consequences of Single Market Project of the European Commission on the insurance industry in Germany from 1992 to 1996 and found increasing divergence between fully efficient firms and efficiency laggards. They also concluded that productivity performance was negatively affected by age of company and cost saving potentials existed in industry.

Diacon (2001) undertook an international comparison of the efficiency of companies transacting general insurance business during 1999 using a sample of 431 general insurers from UK, France, Germany, Italy, The Netherlands and Switzerland and concluded that UK companies were most efficient in Europe.

Diacon *et al.* (2002) explored the efficiency of European specialist and composite insurers transacting long-term insurance business from 1996 to 1999 using DEA and concluded that average technical efficiency declined for the period of study. Very large and very small insurers were most efficient in pure technical terms. They found that countries showed some striking international differences.

Mahlberg and Url (2003) found reduction of market imperfections after the implementation of Single Market measures while measuring the effects of liberalization on technical efficiency and the productivity development of the insurance industry in Austria during 1992-1999 using DEA.

Hardwick *et al.* (2003) examined the empirical relation between various corporate governance mechanisms and cost efficiency in UK life insurance firms taking a sample of 50 life insurance companies. They found that cost efficiency was positively related to the existence of an audit committee and negatively associated with the proportion of outside directors and separation of the CEO and chairman functions.

Tone and Sahoo (2005) examined the performance of Life Insurance Corporation (LIC) of India using DEA from 1982 to 2001. They used labor, business services, debt capital and equity capital as input variables and present value of real losses incurred and ratio of liquid assets to liabilities as output variables. They found increase in allocative inefficiencies after 1994-1995 and increase in cost efficiency in 2000-2001.

Barros *et al.* (2005) analysed total productivity change in a sample of 27 Portuguese insurance companies using DEA Malmquist productivity index. They found that some companies were experiencing productivity growth during 1995-2001.

Yang (2006) comprehensively evaluated 72 Canadian insurance companies for the year 1998 with the help of a two-stage DEA model and concluded that Life & Health insurance industry operated fairly efficient.

Barros and Obijiaku (2007) evaluated the performance of insurance companies in Nigeria taking a sample of 10 insurance companies and analysed the situations of these companies in relation to the frontier of best practices for the year 2001-2005. They also tested for the roles played by dimension, bank network and market share in the efficiency of insurance companies. It was found that majority of companies were pure technical efficient and scale was the major issue in management. It had emerged that dimension, bank network and market share were all issues that were determinant factors of the efficiency of insurance companies.

Wu *et al.* (2007) provided valuable managerial insights when assessing the dual impacts of operating and business strategies for life and health (L&H) insurance industry in Canada from 1996 to 1998 using new DEA model, which was suitable for simultaneously assessing the production and investment performance of the companies, and found that L&H insurance companies operated very efficiently.

Kao and Hwang (2008) investigated efficiency decomposition of 24 non-life insurance companies in Taiwan during 2001-2002 in a two-stage production process where the outputs of the first stage become the inputs of the second stage. They found that none of the 24 insurance companies performed efficiently in both the stages.

Wende *et al.* (2008) examined the relation between efficiency and organizational structure in the German insurance industry and investigated the effect of the regulatory framework on the relative efficiency of alternative organizational forms in the insurance industry taking a sample of 40 property liability insurance companies during 1988-2005 using DEA. They concluded that regulation influenced comparative advantages of organizational forms. Stock cost frontier dominated public cost frontier after the deregulation. Stock, mutual and public insurers were operating on separate production representing different technologies.

Sinha and Chatterjee (2009) estimated cost efficiency of the Indian life insurance companies for the period 2002-2007 with the help of DEA. They took operating expenses and commission expenses as input and benefit paid to customers and net premium mobilised as the output of the study. They found an upward trend in cost efficiency up to 2005, after that trend was reversed.

Afza and Asghar (2010) analysed the efficiency level of the insurance industry of Pakistan with the help of DEA taking 33 life and non-life insurers for study during 2003-2007. They concluded that insurance companies were on average 92.7% technical, 81.12% allocative and 75.44% cost efficient. It was also found that allocative and cost efficiencies were improved from 2003 to 2005 but decreased in 2006.

Gamarra and Growitsch (2010) explained the success of different distribution strategies in the life insurance industry and analysed the performance of single and multichannel distribution firms in Germany using DEA during the period of 1997-2005. They concluded that the absence of performance advantages for specialized insurers provided economic evidence for the coexistence of the different distribution systems.

Xie (2010) studied the performance of publicly held firms in the US property-liability insurance industry by analysing companies that issued IPOs during 1994-2005 and found that IPO significantly increased with firm

size and premium growth. It was also concluded that IPO firms experienced no post-issue underperformance in efficiency, operations, stock returns. IPO firms performed no worse than private, after public offering.

Lin *et al.* (2011) discussed the technical efficiency, assessed the productivity changes of various life insurance companies and explored the reasons for such changes in 24 life insurance companies of Taiwan during 2005 to 2009 using DEA, Malmquist Productivity Index (MPI). They found that average technical efficiency was relatively low. Except a few companies, most companies grew in productivity.

Biener and Eling (2011) measured the performance of micro insurance programs using DEA and derived implications for the viable provision of micro insurance products in Africa, Asia and Latin America. They found diversity in performance of programs but there was overall positive development of productivity. It was found that technical efficiency was negatively correlated with size. Large and for-profit micro insurers were able to improve performance when focusing on the use of state-of-the-art technology.

Tsai *et al.* (2011) investigated the relative efficiency of each life insurance company at various stages of production activities using two-stage DEA model in Taiwan for the year 2005-2006. They concluded that there was not much difference between new and old companies, companies of various sizes, listed and unlisted companies in efficiency values in both operational stage and profitability stage.

Naini and Nouralizadeh (2012) analysed the effects of entrance deregulation on the efficiency in the Iranian insurance market by studying 20 general insurance companies during 2003-2010 and concluded a decline in efficiency. Ownership type and failure to meet the risk management rules were found to be the main drivers of efficiency.

Al-Amri *et al.* (2012) analysed the performances of the insurance sector and carried out a comparative analysis for its different units in Gulf Cooperation Council (GCC). They found that insurance industry was moderately efficient. There was high dispersion of efficiency score. Insurance sector was experiencing high growth accompanied by improvement in technical efficiency.

Shahroudi *et al.* (2012) measured the efficiency of 14 private insurance companies via two-stage DEA model in Iran during 2007-2009 and concluded that deficiencies in companies were because of investment weakness.

Turkan *et al.* (2012) examined the technical efficiency performance of 23 Turkish non-life insurance companies for the year 2007. Their study included number of agents, number of brokers, fixed assets and shareholders' equity as inputs and outputs were Investment incomes, premiums received. They found RAY as the most efficient company.

Shinde (2012) and **Nandi (2014)** revealed that LIC performed better as compared to others insurance companies. They studied the cost efficiency of all private and public sector life insurance companies in India

from 2000 to 2010 and measured the relative performance efficiency of 13 life insurance companies in India during 2002 to 2012 respectively.

Sabet and Fadavi (2013) measured the relative efficiencies of insurance firms in Iran during 2006 to 2010 using two-stage DEA model. They concluded that market was monopolised and only four firms were efficient.

Lee and Yang (2014) assessed the operational efficiency of life insurance companies in Taiwan using Fuzzy DEA. They concluded that the operational efficiency of financial holding insurance companies was better than non-financial holding companies.

Barros *et al.* (2014) concluded that older Portuguese origin companies were more efficient than others were, while analysing the efficiency noted in 7 insurance companies in Angola during the period 2003 to 2012.

Khan and Noreen (2014) measured the performance of insurance and Takaful industry and tried to explore the relationship between the efficiency and productivity with different operational measures of risk protection in Pakistan. They concluded that takaful firms were more efficient than conventional insurer. Insurance firms were technically efficient. However, they did not find any contribution of technology to improve productivity.

Zhen and Junwen (2014) evaluated the sustainable development capability of property and casualty insurance enterprise during 2008 in China. They took a sample of 5 property and casualty insurance companies and concluded that PICC P&C was most efficient.

Mathur and Paul (2014) measured the efficiency of 20 non-life insurance companies in India during 2012-2013 using DEA and found that inefficiency of the insurers was due to scale inefficiencies and ratios had directional impact on the technical efficiency.

Afsordeh and Moridipour (2014) evaluated the performance of all insurance companies working in Iran during 2011. They found that DEY insurance company was more efficient and RAZI insurance company had weaker efficiency than other firms.

Sinha (2015) concluded that the mean technical efficiency of companies fluctuated significantly implying oscillating divergence from frontier while benchmarking the performance of 15 life insurance companies of India using dynamic DEA model using operating expenses and commission as input, premium collected and sum assured as output and investment as free link.

Micajkova (2015) estimated the efficiency of the insurance sector of Republic of Macedonia taking 11 insurance companies for the study during the period 2009-2013. Increase in average efficiency and scale efficiency was found. The main source of inefficiency was due to scale inefficiency.

Zimková (2015) analysed the technical efficiency and the super-efficiency of a representative sample of insurance institutions in Slovakia with the aid of DEA for the year 2013. Majority of insurance institutions were found to be technically efficient.

Babatunde and Haron (2015) found low efficiency throughout the study period 2008-2012 while investigating the performance of insurance companies of Nigeria using DEA. Inputs of the study were commission and management expense and outputs were earned premium and investment income.

Reyna and Fuentes (2015) examined the cost variations decomposition of the insurance companies in Mexico for the period of 2002 to 2012 with the aid of DEA and found that cost did not reduced because of productivity gains, except some small size companies that did not influence industry's performance.

Ertugrul *et al.* (2016) analysed the effectiveness of underwriting processes for insurance companies in Turkey during the period 2010 to 2014, taking a sample of 12 non-life insurance companies. Inputs used in this study were number of policies and written premiums. Insurance technical provisions and losses paid were the output of the study. It was found that Decision Making Unit (DMU) 9 and DMU 4 were least efficient insurers in terms of scale efficiency and DMU 8 was most inefficient insurer in terms of average efficiency.

Efficiency evaluation on the basis of size of insurance companies:

Some of the studies have examined the efficiency of insurance companies based on their size. It was concluded that large companies were less efficient than small companies in the study of **Rai (1996), Hardwick (1997)** and **Rahman *et al.* (2014)** while examining and analysing efficiency of insurance sector in 11 countries including Japan and US; UK and Bangladesh respectively. But **Hao and Chou (2005), Saad *et al.* (2006), Borges *et al.* (2008), Eling and Luhnen (2008)** and **Saad and Idris (2011)** concluded in the other direction that large size companies found to be more efficient in their study of Taiwan; Malaysia; Greek; insurance industry of 37 countries and Malaysia and Brunei insurance markets respectively. **Shujie *et al.* (2007)** found firm size as the important factor affecting the firm performance in their study of Chinese insurance companies. **Luhnen (2009)** and **Wasseja and Mwenda (2015)** also found a positive relation between efficiency and size in German property-liability insurance industry and life insurance industry in Kenya respectively.

Efficiency evaluation on the basis of ownership structure of insurance companies:

The researchers have noticed that there is difference in the efficiency of insurance companies based on their ownership structure. **Diboky and Ubl (2007)** found lack of efficiency in public insurers while checking the ownership effect on efficiency by analysing the Germany life insurance market. **Bawa and Ruchita (2011)** supported this conclusion in Indian health insurance business of general insurance companies by mentioning that technical efficiency of private companies was 77% and of public companies was 67%, improvement space was decreasing for private sector insurer and public sector companies were showing reverse

improvement space. **Ashraf and Kumari (2015)** upheld the above result and found improvement in investment efficiency of private life insurance industry of India during the period 2010-2014. Another study by **Shinde (2012)** of the cost efficiency of all private and public sector life insurance companies in India stated that the cost efficiency score for private companies was inconsistent. His result was reinforced by **Mandal and Dastidar (2014)** during their study of the efficiency analysis of the Indian general insurance sector and assess the impact of the global slowdown on the performance of the allied sector. They stated that lesser variations were found in public sector's performance, while private sector companies were badly affected by slowdown.

Efficiency evaluation and mutual companies:

As far as mutual insurance companies are concerned, **Cummins and Zi (1998)** found that stock and mutual insurers were equally efficient after controlling for firm size in their study on 445 life insurers in US. But **Brockett *et al.* (2004)**, **Eling and Luhnen (2008)** and **Erhemjamts and Leverty (2010)** concluded that stock companies were more efficient than mutual companies while studying the relative efficiency of the different organization structures used by US property and liability insurance companies; providing new empirical evidence on frontier efficiency measurement in the insurance industry of 37 countries and investigating the role of organizational structure in financial services markets in the US life insurance industry respectively. **Diboky and Ubl (2007)** concluded that stock and mutual companies allocate their resources efficiently and hybrid forms were inferior to pure stock companies while analysing the ownership effect on efficiency in the Germany life insurance market. But **Luhnen (2009)** in his study of comprehensive analysis of efficiency and productivity in German property-liability insurance industry found that mutual companies were more efficient than stock companies. **Ismail *et al.* (2011)** concluded that mutual form had lower and significant return in investment income compared to stock form while examining any significant difference in investment performance between mutual and stock form in Malaysia.

Conclusion

The present paper gives a detailed account of review of literature related to the efficiency measurement of insurance sector in different nations of the world. Majority of the research papers focus on the measurement and explanation on efficiency of insurance companies. A few research papers also determined the relation between efficiency and ownership structure, mutual companies and size of company. This paper contains nine studies, which have evaluated the insurance sector in India. Rest studies belongs to the insurance sectors of rest of the world. So, insurance sector in India can further be evaluated to check its efficiency.

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